Ac Dipole test Review 3/11/08 13:30 held in the SCR. (draft)

Attendees:

Jon Sandberg, Thomas Russo, Peter Oddo

Peter characterized his test – he will use an ENI amplifier like the present ones at RHIC to drive a resonant circuit. The circuit consists of a test magnet wound with Litz wire (presently in 975) and a capacitor bank. The bank will have a smaller bank that can be dynamically switched in and out to keep the magnet on resonance. The frequency is 39kHz +/- 900 Hz. Peter presented drawings of the mechanical layout and electrical configuration.

Other parameters:

- Magnet circulating current – 145 amps
- Peak drive Power supply voltage – 325Vpk
- Bank voltage in resonance – 1.95kV
- L/R time-constant is 633us and takes about 3.16ms for the resonance to decay
- design drive current is 6.6Apk but the PA should tolerate up to 7.7Apk (or more). The PA will shut down if more than 400W of reflected power.
- Maximum instantaneous stored Energy in the bank – 0.6 joule (<< 10 joules)
- The box housing the bank will be totally enclosed and be NRTL inspected prior being energized.
- The mosfets are rated for 900 volts, actual voltage will be limited to 720 volts. Peter said this is a high as he could find.
- Magnet power will be 1kW. Dissipation by the resonant circuit will be 85 watts or 21 watts per FET.
- Q of the magnet is 134-153

Discussion:

- External fans may not be needed. If he uses fans totaling 29 CFM, there will be a 10 degree rise.
- The caps are pulsed rated. Peter picked self healing metalized polyester and this configuration to optimize performance. Final version, caps will be custom designed.
- There are transformers on the input and output. Voltage dividers (not shown on the dwg) will be added for dynamic tuning.
- There will be a low voltage power supply for the gate drivers. Peter has a supply with 3kV rating picked out. There was a discussion of filtering of the low voltage side, and line side.
- Gas tube arrestors will be used (when necessary) to prevent high voltage from appearing on terminals in case of a fault.
- There was a discussion regarding shorting the bank. Peter said the bank discharges very quickly after power is removed.
- The box is to be used for testing of the circuit design. There will be a provision to lock out the power supply when the device is not being tested. Everything will be in close proximity.
- For overnight and longer term tests, and interlock strategy for temperature, current overload, and etc will have to be presented. Peter will start out with low power short term tests before moving to longer term and higher power studies.

- There will be a pre-run inspection prior to energizing any components.

Jon gave approval for Peter to order parts and complete construction of the circuit. It is estimated that when the parts are in house, it will take approximately 2 weeks to build.

Comments from Peter after meeting:

- Only the MOSFET gate-drive circuit and the current-transformers will be isolated. The voltage read-backs will share a common with the magnet's current-return. The current-return will also be tied to the box's safety ground and case. This connection is at a single point.

- Including the estimated switching and capacitor losses, the Q of the prototype magnet is about 1/2 the measured Q of the current RHIC magnets (308-330). Whereas the inductance scaled with the magnet length, the ESR changed very little (prototype: 84mOhm vs. production: 74mOhm). If all works as expected, the prototype-magnet will generate 92% of the field of the current magnets while using about 1/6 of the power.